

INGREDIENTS AND MANUFACTURING METHOD OF WATER DISPERSIBLE PESTICIDE GRANULES

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to ingredients and a manufacturing method of pesticide granules, and more particularly to ingredients and a manufacturing method of water dispersible pesticide granules.

2. Description of Related Art

10 The solid pesticide, that is hard to be dissolved in water or organic solvent, is made as a wettable powder. As investigating the production and marketing of wettable powder of pesticide in Taiwan in 2002, the total output is 1,951,576 Kg. However, the dust of wettable powder easily floats in the air and causes a bad influence upon the user
15 and the environment. Consequently, how to alter the wettable powder of pesticide into water dispersible granules is the most important objective of the pesticide manufacturer.

 The conventional method for manufacturing water dispersible pesticide granules is to compress and dry the ingredients of the water
20 dispersible pesticide granules at temperature 50°C to 130°C. In best mode, the operate temperature is set from 75°C to 115°C.

 In the conventional method, a chemical stabilizer is necessary to prevent the ingredients from deteriorating in the high temperature. However, the chemical stabilizer may reduce the efficacy of the

pesticides.

The present invention has arisen to mitigate and/or obviate the disadvantages of the conventional method for manufacturing water dispersible pesticide granules.

5 SUMMARY OF THE INVENTION

The main objective of the present invention is to provide an improved ingredient and manufacturing method of water dispersible pesticide granules.

To achieve the objective, a water dispersible granule in
10 accordance with the present invention comprises the ingredients of wetting agent, dispersing agent, binder, disintegrant, acid, base, carrier and pesticide, wherein the above ingredients are combined to be 100%. All the above components of pesticide are mixed with water and extruded. The extruded material is baked in an oven that has operation
15 temperature set from 40°C to 50°C and the baked material ground into small granules by machine or manpower.

Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

20 DETAILED DESCRIPTION OF THE INVENTION

The ingredients of the water dispersible granules in accordance with the present invention comprises:

a. wetting agent contained 0.01-5%, in the preferred embodiment of the present invention, wherein the wetting agent is

alkylated naphthalene sulfonate blend (EFW, Manufacturer: Witco U.S.)
and the inclusion rate is best to be 2.25%;

b. dispersing agent contained 0.01-20%, in the preferred
embodiment of the present invention, wherein the dispersing agent is
5 naphthalene sulfonate condensate (D-425, Manufacturer: Witco U.S.)
and the inclusion rate is best to be 2.25%;

c. binder contained 0.1-30%, in the preferred embodiment of
the present invention, wherein the binder is sodium lignosulfonate and
the inclusion rate is best to be 6.5%;

10 d. disintegrant contained 0.1-30%, in the preferred
embodiment of the present invention, wherein the disintegrant is
 Na_2SO_4 and the inclusion rate is best to be 11%.

e. acid contained 0.01-10%;

f. base contained 0.01-10%;

15 g. carrier contained 0.01-80%; and

h. pesticide contained 0.01-90%, in the preferred embodiment
of the present invention, wherein the total rate of the ingredients of e, f,
g and h is best to be 78%.

The acid of the present invention is selected from one of the
20 benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$), p-hydroxy benzoic acid (p-HO-
 $\text{C}_6\text{H}_5\text{COOH}$), succinic acid ($\text{HOOCCH}_2\text{CH}_2\text{COOH}$), succinic
anhydride ($\text{OCCH}_2\text{CH}_2\text{COO}$), phthalic acid ($\text{C}_6\text{H}_4(\text{COOH})_2$), phthalic
anhydride ($\text{C}_6\text{H}_4(\text{CO})_2\text{O}$) and citric acid ($\text{C}_3\text{H}_4(\text{OH})(\text{COOH})_3$). In the
preferred embodiment of the present invention, the acid is benzoic acid

and has a inclusion rate about 4.5-7% by weight.

The base of the present invention is selected from one of the sodium carbonate (Na_2CO_3), sodium bicarbonate (NaHCO_3), potassium carbonate (K_2CO_3), potassium bicarbonate (KHCO_3) and calcium carbonate (CaCO_3). In the preferred embodiment of the present invention, the base is sodium carbonate and has a inclusion rate of 2.25-4% by weight.

All the pesticides in the form of wettable powder (WP) can be used as the pesticides of the present invention. According to the Pesticide Manual issued by the Council of Agriculture, Taiwan, the WP of the present invention is selected from one of the following ingredients, such as carbosulfan, BPMC, triadimfon, triadimefon, tricyclazole, dicloran, pirimicarb, bitertanol, carbaryl, sulfur, chlorothalonil, buprofezin, thiophanate-methyl, propineb, dodine, propoxur, bromacil, metaldehyde, thiabendazole, pencycuron, fenitrothion, procymidone, propargite, fthalide, CPMC, mancozeb, mancozeb+cymoxanil, mancozeb+metalaxyl, maneb, mancozeb+oxadixyl, cyromazine, triflumizole, myclobutanil, dazomet, oxythioquinox, copper oxychloride, MIPC, dithianon, MIPC+chlorpyrifos, thiocyclam hydrogen oxalate, benomyl, quinclorac, oxine-copper+thiophanate-methyl, oxine-copper, diafenthiuron, iprodione, carbendazim, bordeaux mixture, MTMC, fenvalerate, fenbutatin-oxide, niclosamide, cuprous oxide, copper hydroxide+oxine-copper, copper oxychloride+metalaxyl, dichlofluanid,

- phosmet, atrazine, malathion, TMTD, copper hydroxide, thiodicarb, tolclofos-methyl, propazine, ditalimfos, XMC, mepronil, napropamide, propineb+oxadixyl, phosalone, diuron, oxycarboxin, flutolanil, phosphamidon, fosetyl-aluminum, acephate, carbofuran, methomyl,
- 5 ametryne, azinphos-methyl, bensultap, permethrin, cypermethrin, dicofol, fenbutatin-oxide+dicofol, chlorothalonil+thiophanate methyl, fosetyl-aluminum+chlorothalonil, propineb+thiophanate methyl, propineb+polyoxins B, propineb+oxadixyl, thiophanate methyl+streptomycin, tecloftalam, metiram+cymoxanil,
- 10 benomyl+thiram, oxine-copper+cymoxanil, oxine-copper+metalaxyl, carbendazim+iprodione, carbendazim+imazalil, carbendazim+metiram, carbendazim+mepronil, carbendazim+hexaconazole, polyoxins+oxine-copper, polyoxins+thiophanate methyl, polyoxins B, fermizone+fthalide, hexaconazole+thiabendazole, diniconazole,
- 15 kasugamycin+tricyclazole, edifenphos+fthalide, kasugamycin+oxine-copper, kasugamycin+carbendazim, kasugamycin, kasugamycin+copper oxychloride, kasugamycin+fthalide, fosetyl-aluminum+oxine-copper, thiabendazole+oxine-copper, vakidamycin+fthalide, fonofos+cypermethrin, buprofezin+MIPC,
- 20 esfenvalerate+buprofezin, phosmet+carbofuran, phosmet+cypermethrin, pyraclofos, methomyl+flucythrinate, pymetrozine, chlorpyrifos, carbofuran+fonofos and cyromazine.

The following samples are the prescriptions that the WP respectively is from one of the pencycuron, chlorothalonil, benomyl

and carbaryl.

The prescription is as the table 1 when the active ingredient of the WP is pencycuron.

Table 1.

| Components | % |
|------------------------------------|------|
| EFW | 2.25 |
| D-425 | 2.25 |
| Sodium lignosulfonate | 6.5 |
| Na ₂ SO ₄ | 11 |
| Pencycuron | 25 |
| C ₆ H ₅ COOH | 5.75 |
| Na ₂ CO ₃ | 2.25 |
| Clay Powder (Continental Clay) | 45 |
| Total | 100 |

The testing result of the table 1:

| | | |
|---|------------------------------|-------|
| 5 | Dispersibility (%) | 85.27 |
| | Abrasion rate (%) | 0.01 |
| | Suspensibility (%) | 77.26 |
| | Disintegration time (second) | 96 |

After storing at temperature 54°C for two weeks, the active
 10 ingredient decomposed for 4.16 %.

The prescription is as the table 2 when the active ingredient of WP is chlorothalonil.

Table 2.

| Components | % |
|------------------------------------|------|
| EFW | 2.25 |
| D-425 | 2.25 |
| Sodium lignosulfonate | 6.5 |
| Na ₂ SO ₄ | 11 |
| Chlorothalonil | 60 |
| C ₆ H ₅ COOH | 5.75 |
| Na ₂ CO ₃ | 2.25 |
| Clay Powder (Continental Clay) | 10 |
| Total | 100 |

The testing result of the table 2:

| | | |
|---|------------------------------|-------|
| 5 | Dispersibility (%) | 74.77 |
| | Abrasion rate (%) | 0.02 |
| | Suspensibility (%) | 72.32 |
| | Disintegration time (second) | 53 |

After storing at temperature 54°C for two weeks, the active
 10 ingredient decomposed for 1.06 %.

The prescription is as the table 3 when the active ingredient of the WP is benomyl.

Table 3.

| Components | % |
|------------------------------------|------|
| EFW | 2.25 |
| D-425 | 2.25 |
| Sodium lignosulfonate | 6.5 |
| Na ₂ SO ₄ | 11 |
| Benomyl | 50 |
| C ₆ H ₅ COOH | 5.75 |
| Na ₂ CO ₃ | 2.25 |
| Clay Powder (Continental Clay) | 20 |
| Total | 100 |

The testing result of the table 3:

| | | |
|---|------------------------------|-------|
| 5 | Dispersibility (%) | 81.86 |
| | Abrasion rate (%) | 0.04 |
| | Suspensibility (%) | 73.53 |
| | Disintegration time (second) | 132 |

After storing at temperature 54°C for two weeks, the active
 10 ingredient decomposed for 5.01 %.

The prescription is as the table 4 when the active ingredient of the WP is carbaryl.

Table 4.

| Components | % |
|------------------------------------|------|
| EFW | 2.25 |
| D-425 | 2.25 |
| Sodium lignosulfonate | 6.5 |
| Na ₂ SO ₄ | 11 |
| Carbaryl | 65 |
| C ₆ H ₅ COOH | 5.75 |
| Na ₂ CO ₃ | 2.25 |
| Clay Powder (Continental Clay) | 5 |
| Total | 100 |

The testing result of the table 4:

| | | |
|---|------------------------------|-------|
| 5 | Dispersibility (%) | 77.1 |
| | Abrasion rate (%) | 0.04 |
| | Suspensibility (%) | 74.62 |
| | Disintegration time (second) | 83 |

After storing at temperature 54°C for two weeks, the active
 10 ingredient decomposed for 5.05 %.

The manufacturing method of water dispersible pesticide granules in accordance with the present invention comprises the following steps:

Step A: All the components of pesticide are mixed with water

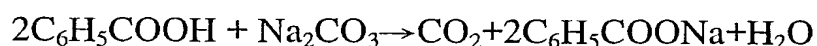
and extruded by a twin-screw extruding machine.

Step B: The extruded material is baked in an oven that has operation temperature set from 40°C to 50°C.

Step C: The baked material is ground into small granules by machine or manpower.

Step D: The granules are selected and each has a diameter between 0.3 mm to 0.8 mm. The select method is to use a first screen mesh and a second screen mesh respectively having a mesh that is 0.840 mm and 0.279 mm. The granules pass through the first screen mesh and are remained on the second screen mesh.

The chemical stabilizer is unnecessary to the present invention because the operation temperature of the present invention is set from 40°C to 50°C. Furthermore, the benzoic acid and sodium carbonate are contained in the present invention such that a neutralization is caused due to the benzoic acid and sodium carbonate when the water dispersible granules are put into water. The chemical formula of neutralization is:



The bubbles of carbon dioxide will cause functions of collapsing and stirring in the water to speed up the disintegration rate of the water dispersible pesticide granules in accordance with the present invention.

An experiment is enforced to confirm the time for fully dissolving the water dispersible pesticide granules of the present invention. The water dispersible pesticide granules of the present

invention are input into a container that is full of water. The container is reversed after inputting the water dispersible pesticide granules for five seconds and repeated reversing the container every four seconds. As a result, the water dispersible pesticide granules of the present
5 invention are fully disintegrated in fourteen seconds. However, the conventional water dispersible pesticide granules without acid and base take about forty-five seconds for fully disintegration.

As described above, the water dispersible pesticide granules of the present invention has a good water dispersible property. A
10 high-temperature process is unnecessary to the manufacturing method of present invention, that is, the stabilizer is unnecessary to the present invention. Consequently, the property and the efficacy of the active ingredients of pesticide are ensured.

Although the invention has been explained in relation to its
15 preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.